EPA's DQO and DQA Processes

- The data quality objectives (DQO) and data quality assessment (DQA) processes help to ensure that decisions are supported by data of adequate quality, quantity, and type

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Data Quality Objectives (DQOs)

- Step 1 - State the Problem
- Step 2 - Identify the Decision
- Step 3 - Identify Inputs to the Decision
- Step 4 - Define Study Boundaries
- Step 5 - Develop Decision Rules
- Step 6 - Specify Limits on Decision Errors
- Step 7 - Optimize Study Design

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DQO Step 1 - State the Problem

- State the specific problem(s) to be solved
- Provide background information to place the problem in a scientific and historical context

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DQO Step 2 - Identify Decisions

- Identify questions the study will attempt to resolve
- Each decision stated under this step will have corresponding decision rules under Step 5

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DQO Step 3 - Identify Inputs to the Decision

- List data needed, based on Steps 1 and 2
- Describe information that must be obtained
- Describe measurements to be taken
- Include historical data
- Include inputs such as cleanup levels or toxicological information

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Step 4 - Define Study Boundaries

- Lateral boundaries
- Vertical boundaries
- Temporal boundaries
- Be as specific as possible

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Step 5 - Develop Decision Rules

- Provide decision rules for each decision statement listed under Step 2
- Formulate rules as "if...then" statements
- Confirm that analytical detection limits are less than the cleanup or action level
- These rules should integrate study outputs into statements that describe a logical basis for choosing among alternative actions

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Step 6 - Specify Tolerable Limits on Decision Errors

- There is always some uncertainty !
- Define tolerable limits based on the consequences of making an incorrect decision
- Limited application of statistics when using a non-probability-based design (judgmental or authoritative sampling) (see EPA 1999)

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Step 6 - Specify Tolerable Limits on Decision Errors (continued)

- Statistical determination when using a probability-based design
- Select power and confidence desired for statistical tests
  - Power is the probability of rejecting the null hypothesis when it is false
- Define measurement quality objectives (MQOs) using data quality indicators

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Step 7 - Optimize Study Design

- The DQO process is an iterative process
- Step 7 is a "steering correction" that may be made to keep the study focused and on course
- Optimize sampling or experimental design
- Subject to budget constraints: Choose the most resource-effective design that meets all DQOs

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Data Quality Assessment

- Step 1 - Review the DQOs
- Step 2 - Conduct Preliminary Data Review
- Step 3 - Select a Statistical Test
- Step 4 - Verify Assumptions of the Statistical Test
- Step 5 - Draw Conclusions from the Data

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DQA Step 1 - Review DQOs

- If DQOs were not previously defined, define them now
- Were there deviations from the sampling plan, and if so, what is the effect of the deviation?
- Are critical data missing?
- Are data adequate to meet acceptable limits on errors ? (see Step 6 of DQOs)

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Step 2 - Conduct Preliminary Data Review

- Calculate summary statistics, using appropriate methods to handle nondetections
- Create statistical plots such as normal probability plots, box-and-whisker plots, and frequency plots
- Conduct distributional and outlier tests
- Look for structure and patterns in the data, get to "know the data"

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Step 3 - Select a Statistical Test

- Based on characteristics of the data set (or sets), select an appropriate statistical test
- Be aware of how selection of the null hypothesis (H_0) will affect conclusions (that is, consider the burden of proof)
  - Innocent until proven guilty
  - Guilty until proven innocent

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Step 4 - Verify Assumptions of the Statistical Test

- Assumptions about data distribution
- Assumptions about equality of variance
- Assumptions about detection rates
- Assumptions about outliers
- "One-sample" versus "two-sample" tests

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Step 5 - Draw Conclusions from the Data and Test Results

- Evaluate performance of design: Were specified levels of confidence and power achieved?
- Interpret results of statistical tests in light of known geology, geochemistry, hydrology (that is, put test results in context)
- Recognize the difference between statistical significance and practical significance

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CSM

not really in sequence

Should be relate to S & F Process

What phase

Threat to H H & E

Threat to gw

7-29-99

QUALITY ASSURANCE PROJECT PLAN
DQO STEPS

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
State the Problem	**Identify the Decisions**	**Identify the Inputs to the Decisions**	**Define Study Boundaries**	**Develop Decision Rules**	**Specify Tolerable Limits on Errors**	**Optimize Sampling Design**
* Existing analytical data for Site 1 groundwater are insufficient to evaluate seasonal and other trends in groundwater chemistry at Site 1 monitoring wells and to evaluate if groundwater chemistry at compliance well MW1-7 is indicative of a release from Site 1 or if it reflects local hydrogeologic conditions at that well.	* Are there well-defined seasonal trends in the chemistry of groundwater near Site 1? * Are there overall trends of increasing or decreasing chemical concentrations in Site 1 groundwater? * Do statistical comparisons of analytical data for groundwater samples from background and downgradient wells at Site 1 indicate a release from Site 1? * If statistical evaluation of analytical data indicates a release from Site 1, does the release pose an unacceptable risk to human health or the environment?	* Existing analytical (validated and defensible) and water-quality data for background and downgradient groundwater at Site 1. * Water-level data for shallow groundwater at Site 1 * New analytical (validated and defensible) and water-quality data for background and downgradient groundwater at Site 1. * Toxicological and risk management data. Data Gaps	* Lateral extent of area consists of Site 1 and adjacent background areas (Site 1 landfill cap is approximately 39 acres) * Vertical extent is defined by the depth of shallow groundwater (about 8 to 10 feet bgs), as sampled by 3 background and 8 compliance monitoring wells. * Temporal boundaries on the study consist of quarterly sampling for one more year, after which time the data will be evaluated to recommend future sampling frequency.	* If there are well-defined seasonal trends in groundwater chemistry, the data will be normalized to remove seasonal effects. * If there are no well-defined seasonal trends in groundwater chemistry, then the frequency of sampling will be re-evaluated. * If overall trends show increasing concentrations of chemicals in downgradient groundwater, then this may indicate a release from Site 1. * If overall trends are constant or decreasing, semi-annual (instead of quarterly) sampling will be recommended. * If statistical tests indicate no significant differences in	* Measurement quality objectives (MQOs) will be established for sample analyses, and the analytical data will undergo QA/QC review to ensure that MQOs are met. * Appropriate parametric or nonparametric two-sample tests will be used to compare background and Site 1 analytical data, with a 95 percent level of confidence (that is, the null hypothesis will be rejected if the statistical test p-value is less than 0.05)	* New and existing analytical data will be evaluated to determine an appropriate sampling frequency (that is, quarterly, semi-annually, or annually), as well as to determine the analytical suite for long-term groundwater monitoring at Site 1.

				chemistry of background and Site 1 groundwater, then a reduced frequency of sampling will be recommended. * If statistical tests indicate significantly higher concentrations of chemical (excepting nutrient species) in downgradient groundwater, the the data will be evaluated to determine if the chemical concentrations pose an unacceptable risk to human health or the environment, and appropriate actions will be recommended based on the outcome of the risk evaluation.		

TABLE A-2

NAWS CHINA LAKE, CALIFORNIA
QUALITY ASSURANCE PROJECT PLAN
DQO STEPS FOR CONFIRMATION STUDY FOR SOURCE REMOVAL ACTION OF SITE 13

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
State the Problem	Identify the Decisions	Identify the Inputs to the Decisions	Define Study Boundaries	Develop Decision Rules	Specify Tolerable Limits on Errors	Optimize Sampling Design
* The two disposal trenches located at Site 13 must be excavated to minimize migration of contaminants from the oily waste to groundwater. *After excavation, additional data are required to evaluate whether the oily waste has been completely removed from the trenches and whether contaminants have migrated. *If residual site-related chemicals remain after excavation, it must be determined if they are present at concentrations that pose a risk to human health or environment.	*Has the oily waste been completely removed from the two disposal trenches? *Have the chemicals of concern migrated beyond the limits of the disposal trenches? *If chemicals have migrated, do they exist at concentrations that pose a potential risk to human health or the environment?	*Validated definitive chemical data for TPH-e, total metals, PCBs, pesticides, VOCs, and SVOCs, from soil and water samples collected in the trench excavations will be used to evaluate whether contaminated soil has been completely removed. *Existing and new data will be compared to occupational PRGs and screened using the U.S. EPA Hazard Ranking System to calculate potential risk to human health or the environment.	*The two trenches at Site 13 are approximately 100 feet long, 10 feet wide, and 10 feet deep. Each trench will be excavated to 10 feet below natural ground surface. *Soil and water samples will be taken from the two excavated trenches. Samples will be taken from each trench from along each sidewall, from each endwall, and from the floor of each trench. A maximum of 4 water samples may be taken from each trench floor. Groundwater samples will be taken only if groundwater appears in the trenches after excavation. *The study will be conducted over 7 months, using a phased approach. *Chemical data for samples from the trench excavation will be used to guide the Phase II RI.	*If contaminants are not above the detection limits specified in this QAPP in soil and water samples taken after trench excavation, recommend no further action. *If contaminants are detected in soil and water samples taken after the trench excavation, determine if the concentrations are above occupational PRGs. If the concentrations are above PRGs, perform a human health risk assessment to assess potential risk to human health. *If contaminant levels pose an unacceptable risk to human health, determine the course of action for future investigations.	*Statistical analysis has been performed on existing data. A minimum sample population of 28 satisfies the EPA minimum guidelines for limiting the uncertainty in the data set: 80 percent minimum confidence level, 90 percent minimum power, and 10 to 20 percent MDRD between the site and background levels.	*The sample size selected in DQO Step 6 represents the highest level of confidence that could be achieved given the variability of existing data and the budget constraints for this project. *A phased approach will be used. The data collected from the trench excavation (Phase I) will be used to determine the future actions, if any, that will need to be taken during the Phase II RI.

Notes:

DQO	Data quality objectives
EPA	U.S. Environmental Protection Agency
MDRD	Minimum detectable relative difference
PCB	Polychlorinated biphenyl
PRGs	Preliminary remediation goals
RI	Remedial investigation
SVOC	Semivolatile organic compounds
TPH-e	Total petroleum hydrocarbons-extractable
VOC	Volatile organic compound

Disposal Area A

QUALITY ASSURANCE PROJECT PLAN
DQO STEPS

STEP 1 State the Problem	STEP 2 Identify the Decisions	STEP 3 Identify the Inputs to the Decisions	STEP 4 Define Study Boundaries	STEP 5 Develop Decision Rules	STEP 6 Specify Tolerable Limits on Errors	STEP 7 Optimize Sampling Design
1) Houses on top of potentially hazardous area 2) Do we need to do anything about this debris 3) What are the exposure pathways Top 5 feet unrestricted use Inhalation of dust	Exposure area Backyard Common areas play yards B) debri - characterize extent ground penetrating radar		use			use elipgrid OV USP Visual sample plan